## H44 Application of Geopedology to Forensic Anthropology: Can Vivianite Be a Marker of Burial in Soil? – Three Case Reports

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The goal of this presentation is to illustrate the potential use of geopedologic analyses in determining the prior burial of human remains in cases of remains coming from an unknown context and which may have been previously buried and then exhumed.

This presentation will impact the forensic science community by showing how the presence of vivianite inside the bone structure of buried bodies may be considered a marker of a previous burial, even if soil residues are no longer recognizable on the remains.

Three cases were studied: the first case concerns the finding of a skeletonized corpse of an old woman wrapped in a blanket, who was buried by her daughter in the house garden seven years before; the second case concerns a corpse buried in a 80 cm deep grave in a wooded area 20 years before, following the indications provided by organized crime; the third case is that of a skeletonized human cranium found within a building site.

Sections of samples of bone from the three cases underwent petrographic microscopy and composition microanalyses by scanning electron microscopy (SEM-EDS), in order to verify the presence of vivianite crystallization in bones. Vivianite is an iron hydrated phosphate ($Fe_3(PO_4)2{\cdot}8(H_2O)$) and a reducing agent, rich in organic material, usually observed in anoxic environments. In these conditions the ferrous ions ($Fe^{2+}$) in the soil combine with phosphorous from the surrounding environment, as seen in archaeological contexts (for example, in ancient latrines). In cases of buried corpses, the soil is a source of ferrous ions and bone provides phosphorous; the decomposition processes create the necessary reducing conditions. Therefore, the presence of vivianite within the bone structure may indicate that the corpse was previously under soil even if the skeletonized remains are found in a different environmental context.

In all three cases analysis by petrographic microscopy showed blue- green-violet shades in different bone districts, which indicate the presence of vivianite. Microanalyses by SEM-EDS confirmed that the chemical composition of this material is concordant with vivianite, although further analyses need to be performed.

In addition, in the third case the SEM-EDS highlighted an inclusion of geopedologic material inside the diploe. This detail stresses the potential of microtrace analysis in verifying whether the skeleton has been in soil. In addition, geopedologic microtraces may allow one to compare the mineralogical residues with soil samples from the possible area of burial.

This study showed the presence of vivianite inside the bone structure of buried bodies, which may be considered a marker of a previous burial, even if soil residues are no longer recognizable on the remains.

Further analyses are needed, however, in order to improve the knowledge of this field of geopedology.

**Forensic Anthropology, Geopedology, Burial**

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